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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

July 23, 1992

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

RM-8013

**Re: RM-8013: Amendment of Section 90.239 of the Commission's Rules to Adopt Permanent Regulations for Automatic Vehicle Monitoring Systems**

Dear Ms. Searcy:

Allen-Bradley Company, Inc. (A-B), hereby opposes the above-referenced Petition for Rulemaking of PacTel Teletrac (PacTel).

Our customers throughout the United States have been operating at 915 MHz under Commission licenses a highly-successful automatic vehicle monitoring (AVM) system developed by A-B. PacTel seeks to exclude all but what it calls "wideband" AVM systems from the bands 904-912 and 918-926 MHz, despite the fact that many other AVM systems are currently licensed in those two sub-bands. PacTel would have the FCC license only two such "wideband" systems to a market.

A-B is concerned that, if the PacTel proposal is adopted, many AVM licensees will be forced to look elsewhere for spectrum. The 912-918 MHz band, in particular, will be a likely target. Although A-B AVM technology is very robust, A-B respectfully submits that the public interest would not be served by crowding many AVM systems within a minority of the 902-928 MHz band while giving, at most, two licensees over 61% of that band per market.

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**A-B and Its Technology**

A-B is a subsidiary of Rockwell International and is a longstanding major maker of industrial control devices for use in highly automated manufacturing operations. Headquartered in Milwaukee, Wisconsin, the company has offices in Cleveland and Boston. A-B's customers use A-B AVM devices in their operations throughout the United States and abroad.

For many years, A-B has been investigating the uses of radio techniques to assist industry in the complex environment of modern production. A-B's industrial control devices permit monitoring of the progress of products being built while moving on an assembly line. Moreover, systems using A-B devices can integrate the results of periodic quality control checks made during assembly, enabling corrective action to be taken automatically with regard to individual products or components in order to avoid costly production mistakes. Because A-B devices employ radio technology, they continue to function through manufacturing processes involving chemical and paint applications or exposure to very high temperatures.

In this fashion, A-B technology has already permitted improvements in the productivity of many United States industries involved in large-scale manufacturing and promises to yield even further advancements. One of the clearest demonstrations of the usefulness of A-B technology is that each of the three largest United States auto makers utilize A-B technologies in many of their automobile or component plants. Increasingly, foreign car manufacturers are also using the technology in their United States plants. In addition, suppliers to the automobile industry, such as manufacturers of carburetors and engines, also use the A-B AVM technology. A-B devices are also employed in electronics manufacturing processes, the food processing industry, and in transit and transportation systems where AVM applications are more traditional, such as light rail, mining, and trucking, to name just a few examples.

The technology, which A-B has refined, revolves around two major components: "tags" placed on the moving components being monitored and a series of intelligent antenna units (IAUs), each of which consists of a reader and processing circuitry.

In the manufacturing context, the readers are located at fixed points along the assembly line. The readers transmit interrogation signals at relatively low powers at 915 MHz to the tags over short ranges, typically 0.5-20 feet. The tags are mounted on vehicles that move down the assembly line. As the tags encounter the transmitted

signals, Electrically Erasable Program Memory ("EEPROM") in the tags is powered by rectifying some of the received radio frequency energy.

Data from the tag are transmitted through re-radiation of the modulated second harmonic (1830 MHz) of the incoming frequency. Some tag versions have batteries, but only for the purpose of powering and refreshing a random access memory ("RAM") based system, not to transmit signals. Although the harmonic is low in signal strength, the tag re-transmissions can be received over the short (0.5-20 feet) distance used for these applications.

In addition to the IAU reading the tags and processing that information, the memory of many battery-operated, RAM-based A-B tags can be altered as the readers write the status of the component, product assembly, or automobile directly to the tag. The readers are connected to a remote computer/controller, which interprets tag details, initiates automated operations as appropriate, and in some cases writes to the tag memory.

Thus, for example, if a carburetor in the process of assembly fails to pass a certain test, the rewritten tag associated with that item can "inform" the assembly line to dispose of the product or correct the problem, as appropriate. Modern production processes are capable of doing all of this automatically as a result of this tag read-write capability. The potential gains in productivity are obvious and a prime reason why the use of A-B's technology continues to grow.

A-B and its customers have been operating A-B's AVM technology under licenses that include a waiver to operate at 915 MHz. Licenses for this equipment have been granted since at least 1986. Some A-B AVM designs, which operate using extremely low power, can exist under Part 15 of the FCC's rules without authorizations. However, the more advanced tags require higher power and Commission licenses.

The A-B devices represent a better approach to tracking vehicles moving on assembly lines than other traditional solutions. Some of the functions of the A-B devices -- monitoring position along the assembly lines, for example -- may be achieved through the use of bar-code-type readers. However, unlike the A-B system, bar code tags must be precisely aligned with a reader and may be obscured by certain processes, such as chemical or paint applications and those involving very high temperatures. Moreover, bar code technology does not permit data transfer.

A-B's devices are also an improvement over ordinary field disturbance sensors, which can obtain virtually no information except for position. Thus, while a reader

might ascertain a component's stage of assembly, the reader would have no information concerning the success of the performance of the previous stage, information that is critical to a manufacturer demanding efficient, automated quality control. A-B technology overcomes this problem in a commercially practical fashion.

Our company has ongoing research and development efforts to improve continually our technology. Of primary importance, A-B is working to increase the data transfer capabilities of our AVM technology to achieve even greater speeds and volumes. Concomitantly, we are making advances in the read-write capabilities of the tags. Such improvements, of course, will carry with them greater bandwidth requirements.

**A-B's Opposition to the PacTel Petition**

A-B is seriously concerned about PacTel's request that the Commission grant exclusive licenses to certain "wideband" AVM systems at 904-912 MHz and 918-926 MHz. A-B utilizes 915 MHz for its current AVM operations and would not be forced directly to relocate its operations if the PacTel proposal was adopted. However, the FCC action PacTel seeks nonetheless could have adverse consequences for A-B and its customers.

One likely result of exclusive wideband licensing at 904-912 MHz and 918-926 MHz is that other AVM operations in these bands will be forced to relocate. A likely new home for these operations -- as A-B understands that the 902-904 MHz and 926-928 MHz bands would not be adequate to accommodate the relocation -- is the 912-918 MHz band in which AVM operates.

Contrary to the suggestion in PacTel's petition, the spectrum at issue already supports a wide variety of AVM applications that have been fostered by the Commission's existing AVM rules. These applications include:

1. Tracking of and identification ("ID"), location, process control of and data gathering from vehicle locations within large assembly plants;

2. Identification, location, and control of automatic guided vehicles in assembly plants;

3. Vehicle ID and location in mining operations;

4. Gate access control in parking garages and secured areas;

5. Tollway automatic vehicle ID and toll collection;

6. Automatic station/vehicle location ID to allow arrival announcement for light rail commuter systems;

7. Special gate access for handicapped light rail users;

8. Movable pallet ID and location in industrial operations and food processing settings;

9. Identification and location of rolling stock for rail systems;

10. Identification and location of rolling stock, and record transfer of trip recorder data to terminal computer for trucking systems; and

11. Identification and location of containers and cargo at all phases of their journeys through the trucking, rail, and shipping processes.

A-B has built a compatible and robust system that is capable of operating on a non-interference basis in the 915 MHz band, which is allocated on a superior basis to ISM and government radiolocation users. So far A-B has not experienced interference from amateur operations, which are allocated on a secondary basis to A-B's AVM applications. Similarly, A-B's technology has been able to function with the additional noise from the various Part 15 devices, such as cordless telephones, field disturbance sensors, and spread spectrum systems, which increasingly populate this band.

The point, however, is that the 902-928 MHz band already is a very crowded band with significant development activity. Agency action that will cause even further crowding in one segment of this band will only put added pressure on A-B's AVM systems as well as those of other AVM operators forced to congregate there, to the detriment of both and contrary to the public interest in the development of many types of AVM technology. Indeed, if the PacTel technology is as delicate as its petition indicates that it might be, those pressures will be exacerbated even further if PacTel's advantage of exclusivity also forces amateur and Part 15 operations out of the 904-912 MHz and 918-926 MHz bands. Additional crowding in the 912-918 MHz band, no doubt, probably will be the ultimate result.

A-B respectfully submits that the Commission should be careful not to endanger the regulatory environment at 902-928 MHz in which several types of AVM operations and many other radio uses have grown and flourished and continue to do so since the current AVM rules were adopted in 1974. Because of the characteristics of the bands,

continued access to 902-928 MHz is particularly important for a wide variety of AVM systems, including those that depend on tags, such as A-B's.

At lower AVM frequencies, battery-less operation is less feasible because of the lower power density of the readers' signals. Moreover, tags requiring batteries would be unusable in the high-temperature environments of automobile assembly whose temperatures during paint operations, for example, can exceed 200 degrees Celsius. Battery-less operation is also highly desirable in transportation and mining applications because it is often impractical to change batteries where access is limited or dangerous. Use of lower frequencies would also increase tag size; at 450 MHz, for example, tag size would quadruple, to about 2x10x2 inches, making the tags unacceptable for many current uses.

At higher frequencies, tags suffer capture area losses. At 2450 MHz, for example, the power loss is 8.5 dB compared to 900 MHz operation, assuming a constant reader effective radiated power and equal antenna gain in the tag. Consequently, tags at 2450 MHz would have to be larger than tags at 915 MHz to accommodate the antenna array needed to compensate for the loss.

We would not object to a change in the rules that would allow our own technology and the technologies of others that can coexist with ours to share spectrum across 902-928 MHz. A-B has designed its systems to operate in such an environment. PacTel should be encouraged to do the same.

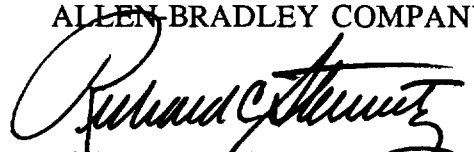
The FCC should not, in contrast, adopt policies and rules that favor one, interference-intolerant AVM technology where the effect will be to retard the development and use of other AVM technologies already proven to serve the public interest. Exclusivity for PacTel and other wideband AVM operators would ultimately

have such a regressive effect. Further, given the Commission's mandate in the Communications Act to promote new, spectrally efficient technologies, it would be an undesirable precedent if exclusivity becomes the reward for fragile, spectrally inefficient technology.

Accordingly, for the reasons discussed herein, A-B asks that the Commission deny the PacTel Petition for Rulemaking.

Respectfully submitted,

ALLEN-BRADLEY COMPANY, INC.



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